Lower Colorado River Multi-Species Conservation Program

Balancing Resource Use and Conservation

Contributions of the LCR MSCP to the recovery of Razorback Sucker on the Lower Colorado River

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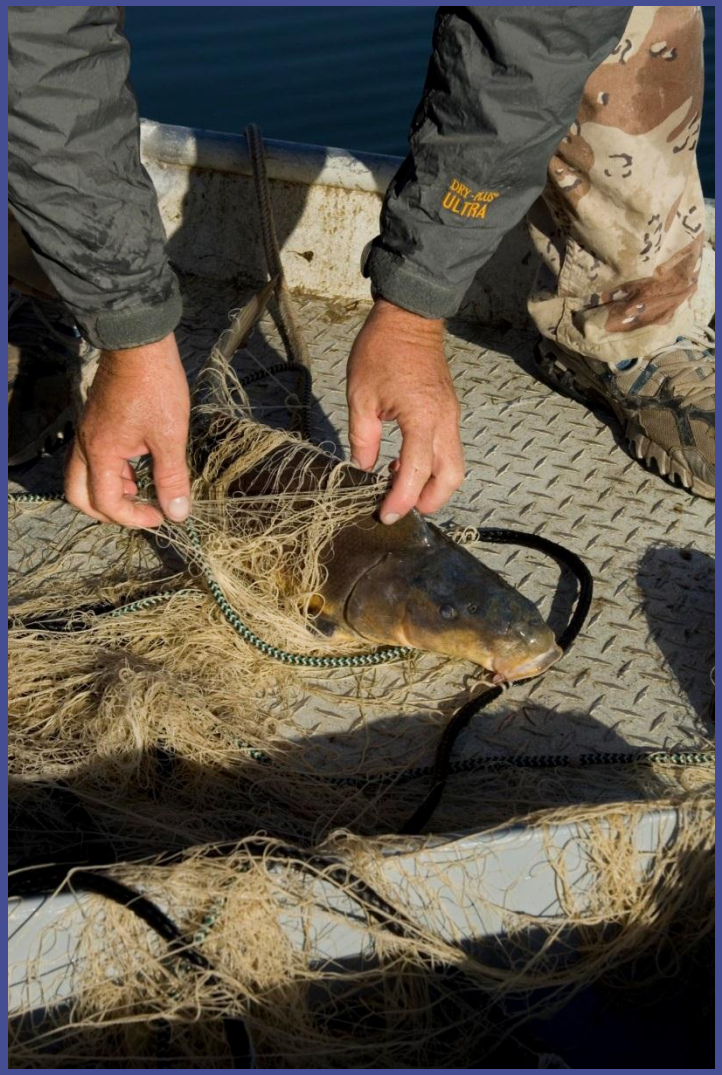
Disclaimers

LCR MSCP program overview
- Fisheries
- Razorback Sucker

Contributions to recovery
- Habitat Creation
- Research and Monitoring
- Augmentation

Augmentation Research
- Challenges for stocked fish
- Improving post stocking survival
  - Flow conditioning
  - Predator recognition and avoidance



Disclaimers

LCR MSCP is *not* a recovery program

ESA mitigation for current and future river operation
No recovery goals

However…

LCR MSCP Goal:

- Conserve habitat and work toward the recovery of T&E species, as well as reduce the likelihood of additional species being listed;
- Accommodate present water diversions and power production and optimize opportunities for future water and power development, to the extent consistent with the law; and
- Provide the basis for incidental take authorizations (Section 7 and Section 10 permits)

LCR MSCP Fisheries

Conservation Measures for the 4 “Big-River” fishes

3 Components Specific to Razor back sucker:

- Research and Monitoring
- Habitat Creation
- Augmentation

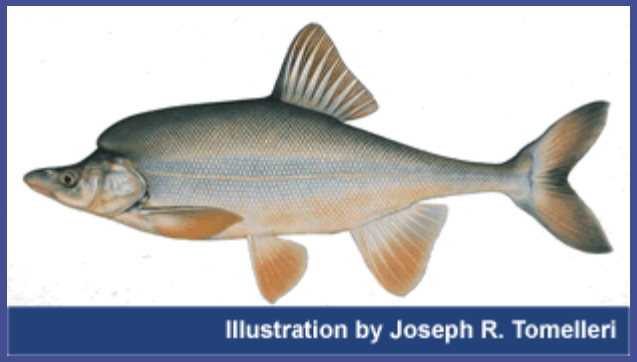
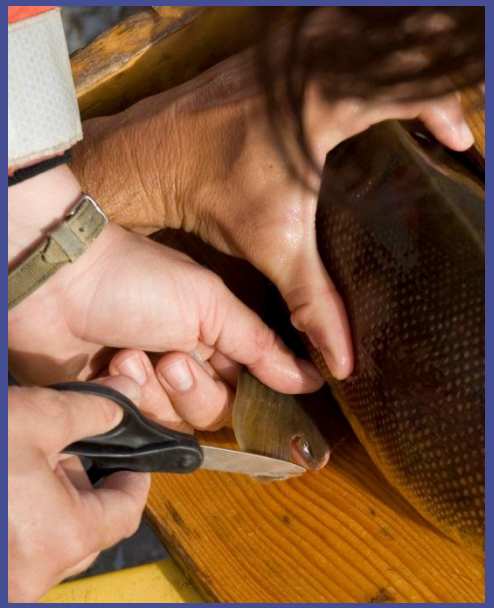


Illustration by Joseph R. Tomelleri

LCR MSCP Fisheries

- Research
  - Habitat
  - Life history requirements
  - Techniques (stocking and sampling)

- and Monitoring in system-wide and created habitats
  - Populations
  - Genetics
  - Water quality/habitat parameters



LCR MSCP Fisheries

- Habitat Creation
  - 360 acres backwater habitat
    - Refuges for native fish
    - Species research
    - Future augmentation

LCR MSCP Fisheries

Augmentation

- 660,000 Razorback Sucker to be stocked
- Over 180,000 currently stocked into Reaches 2 through 5

Maintaining current population
Maintaining genetic integrity

Augmentation Research

Challenges for stocked fish

- Foraging
- Predation
  - Predatory fish
  - Piscivorous birds

How to improve post stocking survival?

- Improve stocking methods/ reduce predation
  - Stocking size
  - Day vs. night
  - Stocking densities
  - Stocking locations
- Stocking more “fit” fish
  - Improved foraging
  - Physically superior
  - Predator avoidance

Augmentation Research

Improving post stocking survival

- Flow conditioning
- Predator recognition and avoidance

Flow Conditioning

- TR 1 had an average velocity of 23 cm/s*.
- TR 2 had an average velocity of 36 cm/s.
- The control raceway produced velocities too low to measure.
- Fish were subjected to treatment their respective velocities for 12 hours during the day and off (rest) for the other 12 hours.
- 30 – day trial period

After treatments, swimming stamina, growth, food conversion were measured

*This treatment design produced variable flows throughout the raceway. There were several small dead spots which had little to no flow. However, velocities where the water exited the 12 returns were much higher. This system allowed fish to access these small flow refuges but in order to do so, they must swim through the ‘jets’ of water at each return.

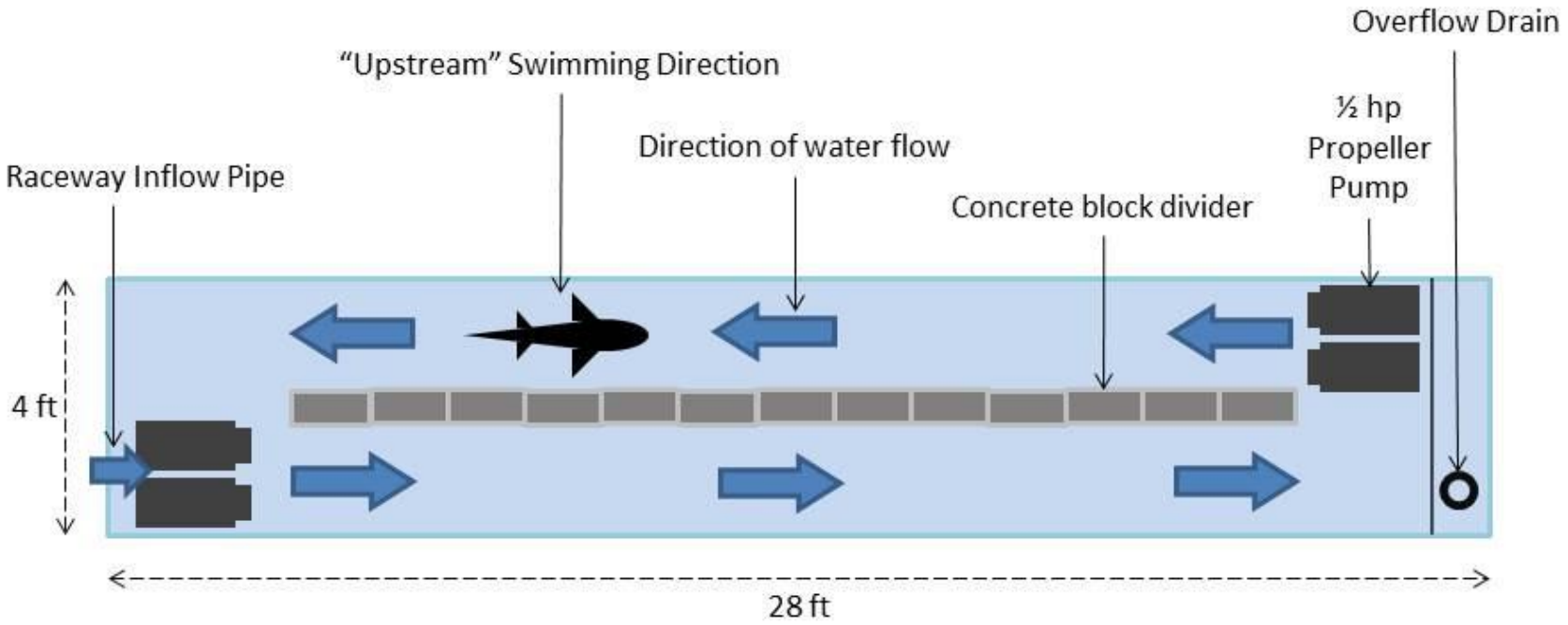
Flow Conditioning

Treatment 1 variable flow

Treatment 2 high flow – razorback present

Flow Conditioning

Treatment 2 diagram



Flow Conditioning - Preliminary Results:

Swimming Stamina

- Mean failure velocity for pre-trial unexercised razorback suckers was 53.4 cm/s.
- TR 1 had a mean failure velocity of 61.1 cm/s. Mean failure velocity for fish in TR 1 was significantly higher than the pre-trial unexercised fish (two-sample *t*-test: $P < 0.05$).
- TR 2 had a mean failure velocity of 81.6 cm/s. This was 28.2 cm/s higher than the pre-trial fish (two-sample *t*-test: $P < 0.05$) and 20.5 cm/s higher than TR 1 fish (two-sample *t*-test: $P < 0.05$).
- Mean failure velocities were significantly different among treatment groups (ANOVA: $F > F_{crit}$, $P < 0.05$).

Flow Conditioning - Preliminary Results:

Swimming Stamina

The mean failure velocities in TR 2 indicate that these fish gained the most in terms of swimming performance. These fish were able to maintain body position at higher velocities than the unexercised control fish and TR 1 fish.

Improved swimming abilities and stamina may improve their ability to escape predation in the wild. Exercised fish could have a higher ‘burst’ swim speed when encountered by a predatory fish and also have the stamina to endure a chase.

Flow Conditioning - Preliminary Results Continued:

Growth

- Unexercised fish gained 5.1 kg over the duration of the experiment (5% increase).
- TR 1 fish gained 10.2 kg (11% increase).
- TR 2 fish gained the most: 47.8 kg (47% increase).
- The mean TL for unexercised fish (289.7 mm) was 16.1 mm longer than the pre-trial mean TL of 273.6 mm (two sample *t*-test: $P < 0.05$).
- Fish in TR 1 (293.4 mm) grew 3.7 mm longer than the unexercised fish (two sample *t*-test: $P > 0.05$).
- TR 2 fish were 24.1 mm longer than the unexercised fish and grew significantly more than the unexercised and TR 1 fish (two sample *t*-test: $P < 0.05$ for both). Mean TL was not significantly different among test groups (ANOVA: $F < F_{crit}$, $P > 0.05$).

Flow Conditioning - Preliminary Results Continued:

Food Conversion Efficiency

Food conversion rates are expressed as the pounds of feed fed for the fish to gain one pound (lb).

- The unexercised fish and TR 1 fish had food conversion rates of 16.1 and 8.0, respectively.
- TR 2 fish had a food conversion rate of 1.7, which was the most efficient among the three test groups.

Senger, B. and Sjöberg, J. 2010. *Evaluation of Flow Conditioning Razorback Sucker in Flow-Through Raceways at Lake Mead Hatchery.* Nevada Department of Wildlife. Prepared for the Lower Colorado Multi-Species Conservation Program, August 2010.

Flow Conditioning - Preliminary Results:

Flow conditioning resulted in:

- Greater swimming performance,
- Improved growth in terms of weight and total length and
- More efficient food conversion

What does this mean for post stocking survival?

Improving post stocking survival

- Predator recognition and avoidance

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For the future…

Improving post stocking survival

- Does improving fitness of stocked fish actually translate to higher survival?
- Is it cost effective?

Questions?

For more information on…

- The LCR MSCP: http://www.lcrmscp.gov/

- Flow conditioning of Razorback Sucker:
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